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Tree Ring Dating of the Emerson Barn, Apple Creek, Ohio

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Sampled: 15th November 2012
Report submitted to Brandon Emerson
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General:
This is the final report describing the tree-ring dating (dendrochronology) of beams in the Emerson Barn. On the 15th of November 2012, Greg Wiles, Nick Wiesenberg, Andy Nash, and Lauren Vargo sampled timbers from the Emerson Barn under the supervision of Brandon Emerson. The objective of this work was to provide calendar dates for the felling of the timbers used in construction of the barn.

Dendrochronology is the science of analyzing and dating annual growth rings in trees. Its first application was in the dating of ancient Indian pueblos of the southwestern United States (Douglass 1921, 1929). Andrew E. Douglass is considered the "father" of dendrochronology and developed the application of tree ring data to archaeological dating. The dendrochronological methods first developed by Douglass have evolved and been employed throughout North America, Europe, and much of the temperate forest zones around the world (Baillie, 1982, 1995).

Methods and Analyses:
Fifteen white oak cores and two beech cores were taken from timbers within the Emerson barn. Eleven of the oak cores were used in this analysis; the beech and the four other oak samples did not date or had too few rings for dating. The Emerson barn was sampled in various locations including the basement of the structure, the rafters, and from a supporting timber located on the first floor (Table 1).

Cores were prepared and crossdated using standard dendrochronological techniques (Figure 1; Holmes, 1983; Stokes and Smiley, 1968). The samples were carefully glued into grooved mounts and sanded to a high polish to reveal the annual tree rings clearly. The rings widths were then measured under a microscope to a precision of ±0.001 mm and then crossdated against each other (Figure 1). The cross-dating of the measurements was assisted by the COFECHA computer program (Holmes 1983).

COFECHA is used to first establish internal, or relative cross-dating among individual timbers from the barn. This step is critical because it locks in the relative positions of the timbers to each other, and indicates whether or not the dates of those specimens with

outer rings are consistent. Subsequently, the internally cross-dated series are each compared with independently established tree-ring master chronologies compiled from living trees and dated historical tree-ring samples. All of the "master chronologies" are based on completely independent tree-ring samples. In the Emerson Barn study, the regional composite master dating chronology is derived from more than 500 ring-width series from old growth living trees and historical structures across Ohio (NE Ohio, Figure 2). All dating results were compared with independent dating masters and in each case the dating reported here is verified as correct.

Results:
The oak samples were successfully crossdated with our calendar-dated master series (Figure 2). The six oak samples with outer rings from the Emerson Barn show cut dates in the late fall or winter after the growing season of 1845 (Table 1). One section of the barn contained timbers that dated to 1860. This one date suggests that an addition to the barn was made at that time. The samples and data used in the report are archived at The College of Wooster – Tree Ring Lab housed in the Department of Geology.

Table 1: *Table of the outer calendar dates for the fifteen cores sampled from the Emerson barn. The presence of the outer rings (cut dates) is indicated. Note that only those cores that were successfully dated are included in this table.*

Emerson Barn				
Sample ID	Date calendar years AD	Location	Species	Presence of Outer Ring
EMERAD1	1860	Addition	Oak	Yes
EMER-01	1845	Main barn	Oak	Yes
EB-01A	1831	Main barn	Oak	No
EB-02	1840	Main barn	Oak	No
EMER4	1845	Main barn	Oak	Yes
EMER04	1845	Main barn	Oak	Yes
EMER5	1845	Main barn	Oak	Yes
EMER6	1845	Main barn	Oak	Yes
EMER7	1834	Main barn	Oak	No
EMER8	1845	Main barn	Oak	Yes
EMER9	1816	Main barn	Oak	No
EMER10	1845	Main barn	Oak	Yes
EMER11	1845	Main barn	Oak	Yes
EB13	1836	Main barn	Oak	No
EB14	1830	Main barn	Oak	No

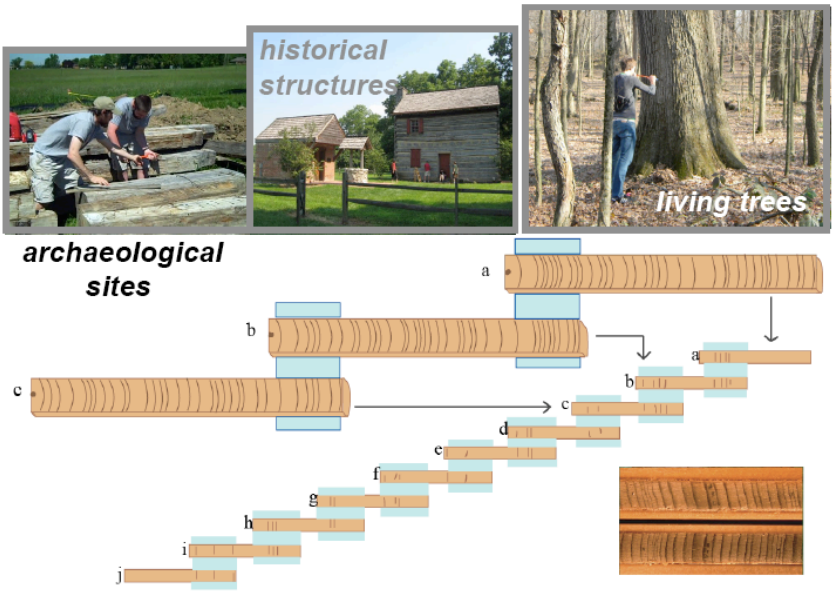

Figure 1: *This diagram illustrates the process of tree-ring crossdating. Patterns in ring widths from historic structures and wood associated with archeological sites are matched to living tree-ring chronologies and thus calendar dates can be assigned to each ring.*

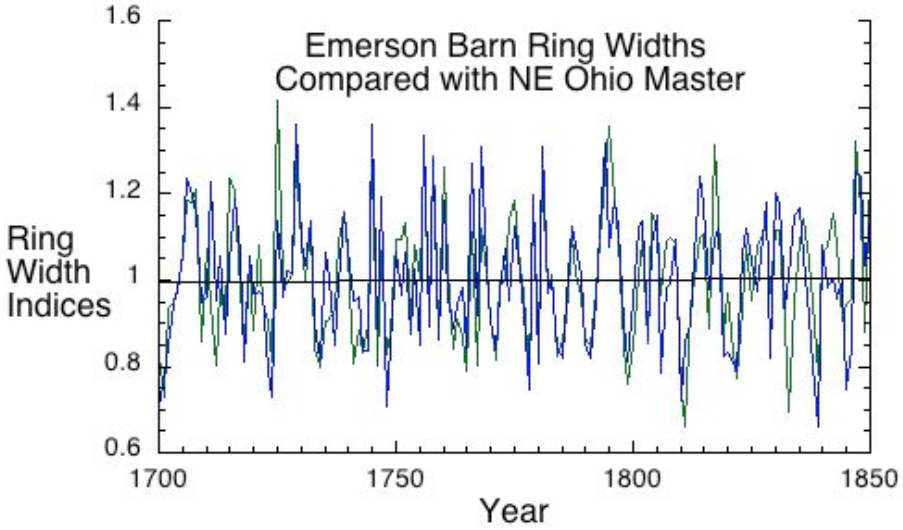

Figure 2: Regional Ohio ring-width series (blue) compared with the Emerson master chronology (green) of the fifteen total dated samples.

References:

Baillie, M.G.L. 1982, Tree-Ring Dating and Archaeology. Croom Helm, London and Canberra. 274 pp.

Baillie, M.G.L. 1995, A Slice Through Time: Dendrochronology and Precision Dating.B.T. Batsford, Ltd., London

Douglass, A.E. 1921, Dating our prehistoric ruins: how growth rings in trees aid in the establishing the relative ages of the ruined pueblos of the southwest. Natural History 21(1), 27-30

Douglass, A.E. 1929, The secret of the southwest solved by talkative tree-rings. National Geographic Magazine 56(6), 736-770.

Holmes, R. L. 1983. Computer-assisted quality control in tree-ring dating and measurement. *Tree Ring Bulletin*, 43 (1), 69-78.

Stokes M. A., and Smiley, T. L., 1968, An introduction to tree-ring dating: Tucson: University of Arizona Press.